

Atomic Periodic Molecular HW

①

- a As you go down group 1 the Radius ↑ b/c more filled Energy levels making the ion larger.
- b Cl Cl^-
 $17p, 17e^-$ $17p, 18e^-$ The anion is larger b/c the extra electron has more ~~e⁻~~ e^- repulsion making the Radius increase.
- c The Al's $3p^1 e^-$ is further away from the nucleus than Mg's $3s^2 e^-$ therefore there is less Z_{eff} holding onto the Al's e^- and it requires less energy to be removed.
- d Upon removal of Mg's 3rd e^- ~~it~~ means removing a core e^- ($2p^6$), This requires a great deal more E than removal of an outer shell e^- .
- e The $p:e$ ratio in Ca^{2+} is higher (20:18) than in Ca (20:20). Therefore the higher Z_{eff} in Ca^{2+} pulls the e^- in closer to nucleus.
- f Ni^{2+} in Nickel chloride gives it paramagnetic properties making it be attracted to magnetic fields. Zn has no unpaired e^- would not make it attracted to Mag fields.
- g K's outer shell e^- is farther away from the nucleus than Li's therefore it experiences less Z_{eff} than Li's and is more easily removed.
- h The $p:e$ 7:10 in N^{3-} is higher than in O^{2-} 8:10. Therefore there is more $e^- - e^-$ repulsion in N^{3-} making it become larger in Radius.
- i Ti^{3+} has unpaired d-orbital e^- which can undergo d-d orbital jump releasing colored light. Na^+ does not.
- j Ti^{3+} can be oxidized by giving off an outer s orbital e^- where Ca^{2+} cannot b/c it would be giving off a core e^- which is not energetically favored.

K Group 6 ~~(Group 6)~~ and Group 11 on periodic table

l P [Ne] $3s^2 3p^3$ paramagnetic Mn [Ar] $4s^2 3d^5$ paramag

Cl [Ne] $3s^2 3p^5$ paramag Cr [Ar] $4s^1 3d^5$ paramag

Zn [Ar] $4s^2 3d^{10}$ diamagnetic Cu [Ar] $4s^1 3d^{10}$ paramag

m $N^{3-} 1s^2 2s^2 2p^6$

Mg $2+ 1s^2 2s^2 2p^6$

V $3+ [Ar] 4s^0 3d^2$

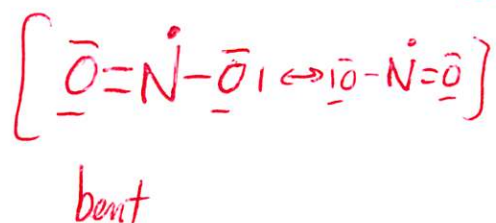
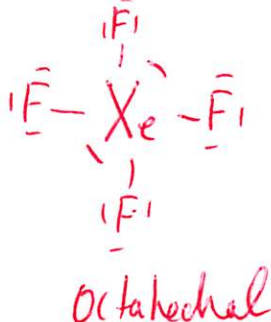
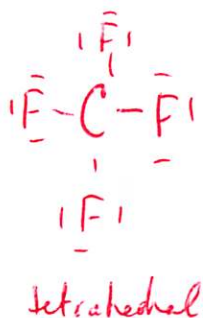
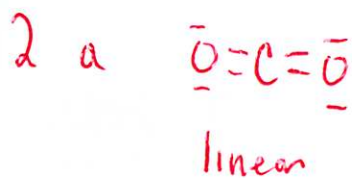
n N $1s^2 2s^2 2p^3$

n	l	m_l	m_s
2	0	0	$+\frac{1}{2}$
2	0	0	$-\frac{1}{2}$
2	1	-1	$+\frac{1}{2}$
2	1	0	$+\frac{1}{2}$
2	1	1	$+\frac{1}{2}$

o $O \begin{array}{|c|c|c|c|} \hline \uparrow\downarrow & \uparrow & \uparrow & \\ \hline \end{array} \begin{array}{|c|c|c|c|} \hline \uparrow & \uparrow & \uparrow & \\ \hline \end{array}$
 $2p \quad \quad \quad 2p$

O has first unpaired e^- in p_x suborbital therefore it is more easily removed than N's e^- which has no unpaired e^- .

p Group 6, Group 11



Linear bond $< 180^\circ$
B/c making 2 $\sigma + \pi$ bonds

tetrahedral
making 4 σ bonds each
 109.5° apart

square planar
has 4 σ bond and
2 unshared e^- pairs

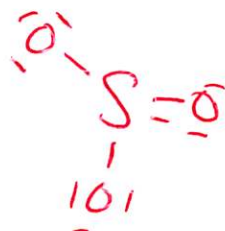
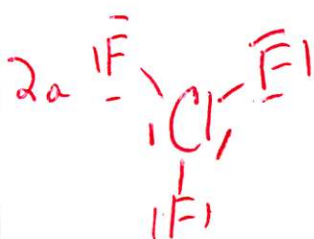
trigonal planar
has 120° angle b/w bonds
and lone e^- pair.

non polar b/c linear
geometry has polarities
of bond cancel

non polar b/c
tetrahedral geometry
has polarities of
bonds cancel

non polar b/c
octahedral b/c plane
shape has polarities
of bonds cancel

polar b/c polarities
of bonds do not cancel
b/c of molecule shape



Trigonal Bipyramidal

trigonal bipyramidal

trigonal planar

trigonal planar

b trigonal T-shaped
3 σ bonds
2 unshared e^- pairs

b see-saw
4 σ bonds
1 unshared e^- pair

trigonal planar
3 σ bonds

trigonal planar
resonance 3 σ^-
1 π bond

c Perhaps polar b/c
polarities of bonds do
not cancel

c Polar b/c polarities
of bonds do not cancel

c Non polar b/c
bond polarities
cancel due to
geometry

d Non polar b/c
polarities of bonds
cancel due to e^-
delocalization + symmetry
of molecule